

## REMARKS

Claims 1-3, 16, and 26 are pending and under consideration.

### **ITEMS 5-6: REJECTION OF CLAIMS 1-3 AND 26 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER CAVAILLE ET AL. (US PATENT NO. 6,103,790) IN VIEW OF BATTISTA (US PATENT NUMBER 3,146,168) OR KOCH ET AL. (W0 99/02568).**

The Office Action rejects claims 1-3 and 26 under 35 U.S.C. 103(a) as being unpatentable over Cavaille et al. in view of Battista or Koch et al. The following remarks are provided to show that claims 1-3 and 26 are nonobvious over these three references.

#### **(i) Re: Cavaille et al. (US Patent No. 6,103,790)**

The Office Action cites Cavaille et al. based on the belief that Cavaille et al. discloses cellulose microfibrils derived from a plant cell wall. However, Cavaille et al. is primarily concerned with cellulose microfibrils of animal origin. In particular, Cavaille et al. focuses on cellulose microfibrils obtained from "tunicin." Tunicin comprises a majority of the marine animals belonging to the family of Tunicata family (see e.g. column 3, lines 12 to 15). Upon reviewing those passages in Cavaille et al. relating to cellulose microfibrils, it is apparent that the teachings of Cavaille et al. relied upon by the Office Action are describing the structural features of cellulose microfibrils derived from an animal.

The Office Action asserts that the claimed loss tangent is inherent to the cellulose of Cavaille et al. However, as described below, because of the plant/animal difference, this property is not inherent. Moreover, replacing the animal cellulose of cavaille et al. with plant cellulose is inconsistent with the essential teachings of Cavaille et al.

Cavaille et al. may describe that microfibrils can be taken from algae with cellulose-containing walls (see column 3, lines 19 to 20) or from parenchyma. See Cavaille et al. at column 1, lines 61 to 64, column 2, lines 9-12 and column 3, lines 38 to 42. However, in such cases, Cavaille et al. fails to teach or suggest how microfibrils having the specific structural features of claims 1 and 26 could be obtained when algae or parenchyma is used as a starting material. And Cavaille et al. specifically teaches away from using cellulose microfibrils from plants such as wood pulp and cotton. See Cavaille et al. at Column 4, lines 60-65, column 2, lines 35-49, column 8, lines 40-47. Indeed, the Examples of Cavaille et al. merely teach how microfibrils are prepared using "tunicin" (i.e. an animal) as a starting material. Therefore,

Cavaille et al. fails to teach or suggest any of the claimed structural features of the cellulose derived from a plant cell wall.

Further, Cavaille et al. discloses that its aqueous dispersions of cellulose microfibrils require stabilization treatment with an acid solution so that the surface of the cellulose microfibrils possess electric surface charges. See Cavaille et al. at column 3, lines 46-62. Cavaille et al. teaches that such acid treatments should also not result in a change in the order of magnitude of the initial degree of polymerization of the cellulose. Id. Cavaille et al. describes that sulfuric acid and phosphoric acid can be used as acid treatments without changing the order of magnitude of the initial degree of polymerization of the Cavaille et al. cellulose microfibrils. Therefore, it is clear that the cellulose microfibrils disclosed in Cavaille et al. must have resistance to hydrolysis.

In comparison, if celluloses derived from a plant are given such a stabilization treatment, the initial degree of polymerization of the plant derived celluloses reduces readily. This is demonstrated in Table 1 of attached document "Hydrolysis and Crystallization of Cellulose," O.A. Battista, Industrial and Engineering Chemistry, 42(3), 502-507 (1950) (hereinafter "the 1950 Battista article"). Table 1 shows that the degrees of polymerization of cellulose materials derived from plants, such as raw cotton and wood pulp, readily reduce by a stabilization treatment. In Table 1, some of these cellulose materials are given "mild" acid treatment with 5 N hydrochloric acid at 40° C for 30 minutes. See 1950 Battista article at first paragraph and Table 1. Specifically, Table 1 shows the degree of polymerization of raw cotton reduces from 3200 to 918, and the degree of polymerization of wood pulp reduces from 1030 to 663, when given the mild treatment of 5 N hydrochloric acid at 40 °C for 30 minutes. The results of Table 1 indicate that cellulose microfibrils derived from plants such as raw cotton and wood pulp do not have the requisite resistance to hydrolysis to undergo the stabilization treatment required by Cavaille et al. Accordingly, the cellulose of claims 1 and 26 (i.e. cellulose being derived from a plant cell wall) could not function as a starting material in Cavaille et al.

Supporting this, Example 1 of Cavaille et al. shows that cellulose derived from sea squirt envelope (a type of tunicin) can undergo stabilization treatment with 15 N (7.5 mol/L) sulfuric acid solution for 20 minutes at a temperature of 60°C, not that celluloses derived from a plant can undergo sulfuric acid stabilization treatment.

Thus, the starting materials required in Cavaille et al. must be derived from a substance like tunicin in order to obtain cellulose microfibrils having sufficient resistance to hydrolysis.

Celluloses derived from a plant starting material cannot be used because they do not have a high enough resistance to hydrolysis.

From the foregoing, it follows that the structural features of the cellulose microfibrils of Cavaille et al. are not the structural features of the claimed cellulose microfibrils as argued by the Office Action. This is because the structural features Cavaille et al. are that of a cellulose derived from an animal (specifically tunicin) and not a plant cell wall.

It also follows that the cellulose microfibrils described in Cavaille et al. are completely different from the claimed cellulose. As described above, the cellulose microfibrils of Cavaille et al. require a stabilization treatment with acid such as sulfuric acid or phosphoric acid so that the surface of the cellulose microfibrils has electric charges.

Therefore, it is clear that properties of a cellulose may be dependent upon the sources from which they are derived (i.e. plant or animal). It cannot be said that the claimed loss tangent is inherent to the cellulose of Cavaille et al. The cellulose of Cavaille et al. is clearly intended to be derived from tunicin, not from the plants from which the claimed water-dispersible cellulose is derived. Moreover, replacing the animal cellulose of cavaille et al. with plant cellulose is inconsistent with the essential teachings of Cavaille et al.

**(ii) Re: Battista (US Patent No. 3,146,168)**

The Office Action asserts that "the Battista patent shows that it is within the ordinary skill of a practitioner of the instant art to [obtain] a water-dispersible cellulose from a cellulose substance having the starting properties as instantly claimed by disclosing cellulose crystallite aggregates from wood pulp..."

Battista (US Patent No. 3,146,168) (hereinafter "Battista" or "the Battista patent") discloses "cellulose crystallite aggregates" obtained by hydrolyzing cellulose. Unit components of a merely hydrolyzed cellulose are rod-like particles, not fibrous particles. This is described in detail in the figures on page 23 of the attached document "Microcrystalline Cellulose", O.A. Battista, P.A. Smith, Industrial and Engineering Chemistry, 54(9), 20- 29(1962)) (hereinafter "the 1962 Battista article"). This document is written by O.A. Battista, inventor of the Battista patent and author of the 1950 Battista article.

Thus, the particle size "less than one micron to about 300 microns" disclosed in Battista would mean a rod-like shape and a length/width ratio of less than 20. This "length/width ratio of less than 20" can be supported at Comparative Example 5 of the Specification in which "Ceolus Cream" was prepared by the following procedures (1) to (3),

1. Hydrolyzing raw material pulp.
2. Washing with water. (Wet crystalline cellulose is prepared.)
3. Triturating (grinding) by a wet beads mill.

In this connection, the material used in Comparative Example 5 of the Specification is commercially available fine cellulose ("Ceolus Cream" FP-03, manufactured by Asahi Kasai Kabushiki Kaisha). The "fine cellulose" is crystalline cellulose fine particles uniformly dispersed in water, and among the best of the "crystalline cellulose aggregates" for suspension stability.

As mentioned above, "crystalline cellulose (aggregates)" is obtained by "hydrolyzing raw material pulp and purifying with water." This is the material disclosed in the 1962 Battista article and Battista. The 1962 Battista article shows a picture of fine particle components obtained by triturating (dispersing) the material. Therefore, the material used in Comparative Example 5 of the Specification corresponds to the material disclosed in the 1962 Battista article and Battista.

Additionally, as understood by comparing Examples 20-27, which use 0.05% of the cellulose described in the application, with Comparative Example 4, which uses rod-like particles (see page 91, line 9 to page 92, line 8 of the Specification), the cellulose of Examples 20-27 had better suspension stability.

As mentioned above, the cellulose disclosed in Battista has a particle shape completely different from that of the claimed fine fibrous shape. The Battista cellulose does not have as good a suspension stability when blended into the food product (for example, cocoa beverage).

Therefore, Battista teaches away from the inventions of claims 1-3 and 26.

The Office Action further asserts that column 2, lines 54-56 of Battista discloses using "wood pulp having 93% alpha cellulose."

However, Battista discloses that the source material (or "starting material" in the Specification) for the cellulose crystallite aggregates may be of any of the neutral cellulose materials, such as natural fibers (e.g. ramie, cotton, purified cotton), purified wood pulps, or regenerated forms of cellulose (e.g. rayon and cellophane). The source material has an actual D.P. greater than its average level-off D.P. See Battista at column 1, line 67 to column 2, line 2. The term "level-off D.P." refers "to the average level-off degree of polymerization of the cellulose produced measured in accordance with [the 1950 Battista article]." *Id.* at column 1, lines 61-66.

Therefore, it is also apparent that Battista fails to teach or suggest using the "tunicin" source material of Cavaille et al. Tunicin was selected in Cavaille et al. for its resistance to

hydrolysis (i.e. resistance to a significant drop in level-off D.P.), and it would not have been obvious to combine Battista with tunicin because Cavaille et al. teaches away from using the source materials of Battista.

**(iii) Re: Koch et al. (WO 99/02568)**

The Office Action asserts that Koch et al. (WO 99/02568) discloses a cellulose compound having a degree of polymerization of approximately 1500. However, it is difficult to see the relevance of Koch et al. to claims 1 and 26. While Koch et al. may disclose a cellulose compound having crystallinity and a degree of polymerization of 1500, Koch et al. does not describe any other features required by the present invention. This is because the purpose and manufacturing method of the present invention are completely different from those of Koch et al.

Koch et al. discloses pre-treating a cellulose raw material having a high crystallinity and a degree of polymerization of approximately 1500 with a specific enzyme to more efficiently produce cellulose derivatives (hydroxypropyl cellulose). To attain this improved efficiency, the cellulose raw materials of Koch et al. must undergo a chemical reaction.

In contrast, a potential purpose of the present invention is to provide the cellulose having excellent properties such as aqueous suspension stability. Although not claimed, the Specification describes the stability occurs without using a chemical reaction of the cellulose raw material.

Accordingly, Koch et al. teaches away from the inventions of claims 1-3 and 26.

Koch et al. also fails to teach or suggest the use of "tunicin" which is used as a source material in Cavaille et al.

**(iv) Claims 1-3 and 26 are patentable over Cavaille et al., Battista, and Koch et al.**

One having ordinary skill in the art would not have been motivated to combine Battista and/or Koch et al. with Cavaille et al. As described above, Cavaille et al. relates to cellulose microfibrils derived from an animal, specifically tunicin. In contrast, neither Battista nor Koch et al. teaches or suggests cellulose microfibrils derived from animals, including tunicin, and Cavaille et al. teaches away from plant cellulose. The purpose and manufacturing method of Cavaille et al. are also completely different from the purposes and manufacturing methods of Battista and Koch et al.

Further, the purpose and manufacturing method of the present invention is completely different from the purposes and manufacturing methods of Cavaille et al., Battista, and Koch et al. Therefore, it would not have been obvious to a person skilled in the art to combine Cavaille

et al. with either Battista or Koch et al. in a way that would achieve all of the structural features of the claimed cellulose.

Accordingly, claims 1-3 and 26 are nonobvious over Cavaille et al., Battista, and Koch et al., alone or in combination. Therefore, the rejection should be withdrawn, which is respectfully requested.

**ITEMS 8: REJECTION OF CLAIMS 1 AND 2 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER CAVAILLE ET AL. (US PATENT NO. 6,103,790) IN VIEW OF BATTISTA (US PATENT NUMBER 3,146,168) OR KOCH ET AL. (W0 99/02568), AND FURTHER IN VIEW OF KAJITA ET AL. (JP PUBLICATION NO. 58013713 A).**

The Office Action rejects claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over Cavaille et al. in view of Battista or Koch et al., and further in view of Kajita et al. (JP Publication No. 58013713 A ). The following remarks are provided to show that claims 1 and 2 are nonobvious over these four references.

**(i) Re: Kajita et al. (JP Publication No. 58013713 A)**

The Office Action asserts that Kajita et al. suggests a fibrous cellulose comprising crystalline components. In this regard, it appears that the Examiner believes that the crystalline component originally contained in a cellulose raw material is also present when the cellulose derivatives are in a liquid crystal state and in the fibers in a solid state. Likewise, the mechanical loss tangent is not present in the starting material.

However, while Kajita et al. (JP Publication No. 58013713 A) may disclose a method for manufacturing fibers in a solid state from cellulose derivatives in a liquid crystal state, the crystalline component originally contained in the raw material is lost in the process. This is because cellulose derivatives are completely dissolved in a solvent when converted into a liquid crystal state, thereby eliminating the original crystalline component. Therefore, the resulting fibers cannot contain the crystalline components as the Examiner believes.

The Office Action also asserts that Kajita et al. discloses the claimed loss tangent. However, the loss tangents are not the same type. The Kajita et al. loss tangent cannot be compared to and does not disclose the claimed loss tangent.

Kajita et al. discloses its fibers as having a mechanical loss tangent ( $\tan \delta$ ) property. Kajita et al. also discloses a method for measuring a mechanical loss tangent, and teaches that

this physical property shows "viscous elasticity of a solid material (e.g. fiber) itself." In Example 1 of Kajita et al., a cellulose derivative fiber has a mechanical loss tangent of 0.06 at 175°C when measured at a frequency of 110 Hz and a temperature increase rate of 5°C/min using a "Rheo-Vibron DDV-IIa" measurement apparatus.

The Rheo-Vibron DDV-IIa is well known as an apparatus for measuring dynamic viscosity of polymer materials (e.g. fibers). The samples to be measured are in the form of a piece. Attached Fig.2 shows a sample fiber piece being measured with the Rheo-Vibron DDV-IIa. Both ends of the sample piece are clipped using chucks of a special jig. One end of the apparatus mechanically vibrates the piece by applying a pushing-pulling while the other end detects the resulting load, and the property is analyzed. The measurement is taken at the high temperature of 175°C. As mentioned above, Example 1 of Kajita et al. takes such a measurement using a Rheo-Vibron DDV-IIa. Therefore, it is apparent that the mechanical loss tangent being measured in Kajita et al. is the viscous elasticity of a solid material.

The claimed loss tangent, on the other hand, is very different from the loss tangent of Kajita et al. The claimed loss tangent is referring to a physical property of an aqueous suspension of a water-dispersible cellulose. See US Publication No. 2005/0272836 A1 (i.e. the Specification) at [0164]-[0172]. This physical property shows the viscous elasticity of a liquid in which solid particles are dispersed. Attached Fig. 1 illustrates how the claimed loss tangent may be measured. A sample of aqueous suspension is put in a cup-type vessel, the vessel is rotated and vibrated, and resulting stress or torque is detected. Measurement is taken at 25°C, and the physical property thereof is analyzed.

Accordingly, it is apparent that the measuring method by which the claimed loss tangent may be measured (e.g. as described in the Specification) is completely different than the method disclosed to measure the mechanical loss tangent of Kajita et al. The claimed loss tangent is a measure of the viscous elasticity of a liquid in which solid particles are dispersed while the mechanical loss tangent of Kajita et al. is a measure of the viscous elasticity of a solid material (e.g. fiber). Therefore, the claimed loss tangent is inherently different from the mechanical loss tangent of Kajita et al.

Accordingly, Kajita et al. teaches away from the claimed loss tangent.

**(ii) Claims 1 and 2 are patentable over Cavaille et al., Battista, Koch et al., and Kajita et al.**

One having ordinary skill in the art would not have been motivated to combine Battista and/or Koch et al. and Kajita et al. with Cavaille et al. Nor would it have been obvious to a person skilled in the art to combine these references to disclose all of the features claimed. As described above, Cavaille et al. relates to cellulose microfibrils derived from an animal, specifically tunicin. In contrast, neither Battista nor Koch et al. teaches or suggests cellulose microfibrils derived from animals, including tunicin, and Cavaille et al. teaches away from plant cellulose. The purpose and manufacturing method of Cavaille et al. are also completely different from the purposes and manufacturing methods of Battista and Koch et al. Additionally, Kajita et al. teaches away from the claimed loss tangent.

Accordingly, claims 1 and 2 are nonobvious over Cavaille et al., Battista, Koch et al., and Kajita et al., alone or in combination. Therefore, the rejection should be withdrawn, which is respectfully requested.

**ITEMS 10: REJECTION OF CLAIMS 16 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER CAVAILLE ET AL. (US PATENT NO. 6,103,790) IN VIEW OF BATTISTA (US PATENT NUMBER 3,146,168) OR KOCH ET AL. (W0 99/02568), AND FURTHER IN VIEW OF DINAND ET AL. (US PATENT NO. 5,964,983).**

The Office Action rejects claim 16 under 35 U.S.C. 103(a) as being unpatentable over Cavaille et al. in view of Battista or Koch et al., and further in view of Dinand et al. (US Patent No. 5,964,983). The following remarks are provided to show that claim 16 is nonobvious over these four references.

**(i) Re: Dinand et al. (US Patent No. 5,964,983)**

The Office Action asserts that Dinand et al. discloses cellulose products having application as a thickener to stabilize suspensions, emulsions and suspensions, for low calorie food products, low fat or low cholesterol food products. See Dinand et al. at column 1, lines 14-16.

However, Dinand et al. teaches cellulose materials having properties that are uncommon to well-known cellulose materials, such as a high degree of cellulose microfibrils and high aqueous suspension stability. To procure these "particular physical and chemical properties," the cellulose materials of Dinand et al. "[are] mainly constituted by cellulose associated with a



residual amount of pectins or hemicelluloses." Id. at column 7, lines 39-44. "In accordance with the invention [of Dinand et al.], a certain percentage of the non cellulosic acidic polysaccharides (pectins, hemicelluloses) is retained at the surface of the cellulose microfibrils...." Id. at column 4, lines 56-59. The cellulose materials disclosed in Dinand et al. are derived from cellulose microfibrils of primary wall plant pulp, found in parenchyma such as beet pulp, citrus fruits, and most fruits and vegetables. See Id. at column 2, lines 24 to 62 of Dinand et al. It is this primary wall cellulose that Dinand et al. associates with pectins and/or hemicelluloses. Id.

On the other hand, the claimed cellulose raw material (identified as "starting material" in the Specification) is different from the raw materials of Dinand et al. As described in the Specification, examples of the claimed plant cell walls are plant cell walls from pulps composed of coniferous trees, broad leaved trees, cotton linter, kenaf, Manila hemp (abaca), sisal, jute, Savaii grass, esparto grass, bagasse, rice plant straw, wheat straw, reed, bamboo, or the like. See US Publication No. 2005/027836 A1 (i.e. the Specification) at paragraph [0047]. From this list, it is clear that the claimed cellulose is not derived from primary wall plant pulp raw material. This is significant because primary wall plant pulp available as a starting material is generally limited in quantity. The claimed cellulose does not require such primary wall plant pulp.

Additionally, since the claimed water-dispersible cellulose does not require an association of a cellulose microfibril main component with pectins and/or hemicelluloses, the claimed fine fibrous cellulose is different from the microfibrils of Dinand et al.

Furthermore, the cellulose microfibrils described in Dinand et al. are also different from the claimed cellulose in that the Dinand et al. cellulose microfibrils must be loaded with carboxylic acids such as galacturonic and glucuronic acid. See the Dinand et al. Examples and claim 1. In contrast, the claimed cellulose does not require loading with carboxylic acids. The claimed fine fibrous cellulose is also capable of providing "a novel gel composition which provides food products in the form of a liquid, sol, gel, paste, or solid with stability with respect to heat resistance, emulsification, suspension, thickening, shelf life, etc." without loading with carboxylic acids.

The Examiner may believe Example 22 of Dinand et al. discloses cellulose microfibrils which have not been loaded with carboxylic acids, and, therefore, that the above-described distinction does not exist. It may be that Example 22 describes cellulose microfibrils containing 93% glucose units prepared from a potato pulp raw material without explicitly stating such cellulose microfibrils are loaded with carboxylic acids. However, considering that Dinand et al. requires its cellulose microfibrils to be loaded with carboxylic acids, the cellulose microfibrils of

Example 22 must also be loaded with carboxylic acids. Therefore, the cellulose microfibrils of Example 22 contains carboxylic acids such as galacturonic acid and glucuronic acid, a component that is not required in the claimed cellulose.

Thus, the claimed cellulose is different from Dinand et al. in that the claimed fine fibrous cellulose is not required to be associated with pectins and/or hemicelluloses, that Dinand et al. requires loading with carboxylic acids, and that the claimed cellulose is capable of producing the above-described gel without being loaded with carboxylic acids.

For these reasons, the cellulose materials described in Dinand et al. are inherently different from the claimed cellulose, and Dinand et al. teaches away from claim 16.

**(ii) Claim 16 is patentable over Cavaille et al., Battista, Koch et al., and Dinand et al.**

As described above, Cavaille et al. relates to cellulose microfibrils derived from an animal, specifically tunicin. In contrast, neither Battista nor Koch et al. teaches or suggests cellulose microfibrils derived from animals, including tunicin, and Cavaille et al. teaches away from plant cellulose. The purpose and manufacturing method of Cavaille et al. are also completely different from the purposes and manufacturing methods of Battista and Koch et al.

Further, Dinand et al. requires its cellulose microfibril main component must be used in association with pectins and/or hemicelluloses and loaded with carboxylic acids to achieve novel properties (i.e. high degree of cellulose microfibrils and high aqueous suspension stability) which cannot be provided when more well-known cellulose materials are used alone. In contrast, the claimed cellulose may provide high aqueous suspension stability by treating the fine fibrous cellulose. Although not excluded by the claims, the Specification makes no mention of treating with pectins and/or hemicelluloses or with loading with carboxylic acids as is required by Dinand et al. Therefore, Dinand et al. teaches away from the invention claimed in claim 16.

In view of the foregoing, it is apparent that no motivation exists to combine Cavaille et al. with Battista, Koch et al., or Dinand et al. It also would not have been obvious to a person skilled in the art to combine these four references to achieve all of the structural features of claim 16.

Therefore, Applicants believe that claim 16 is nonobvious under 35 U.S.C. 103(a) over Cavaille et al. in view of Battista or Koch et al., and further in view of Dinand et al. Therefore, the rejection of claim 16 should be withdrawn, which is respectfully requested.

**CONCLUSION**

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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